Rate of Formation of Ammonium Formate from Carbon Monoxide and Aqueous Ammonia under Pressure

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A Note Concerning the Electric Hexadecapole Moment of the First Excited ^{111}Cd Nucleus

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The attenuation factor of the anisotropy for the angular correlation of γ-rays from ^{111}Cd nucleus which follows the electron capture decay of ^{111}In was derived theoretically for extranuclear cubic fields. It was the present case that the Zürich group has found the empirical formula in order to determine the electric hexadecapole moment of the first excited state of ^{111}Cd nucleus. But the discrepancy of experimental results with the value by theoretical estimations is too large to evaluate the existence of the above nuclear moment.

Then we suggested that their experimental facts can be interpreted by the electric quadrupole interaction induced by lattice phonons in consideration of a limit of the calculated values of the electric hexadecapole moment of the above nucleus.

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The reaction of aqueous ammonia and carbon monoxide has been studied early by K. Fischer *et al.* But no kinetical study has ever been reported with regard to this reaction. We investigated the rate of this reaction by batch experiments under various conditions: the pressure ranging from 165 to 383 kg/cm^2, the concentration of aqueous ammonia being 1.5~3 moles/l, and the reaction temperature ranging 160~220°C. The rate equation obtained under these conditions was

$$\frac{d[HCOONH_4]}{dt} = kP_{CO}{}^{(i)}[OH^-],$$

where $P_{CO}{}^{(i)}$ is the pressure of carbon monoxide devided by its fugacity, and $[OH^-]$ is the concentration of hydroxyl ion in the liquid phase. The activation energy of this reaction was found to be 17.7~17.9 kcal/mole.